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(54) Drilling jig

(57) A multi-purpose drilling jig can accommodate any electric drill having a 43mm. collar, without modification.

Any 90° gear-box 43 with a 43mm. collar can be fitted to the jig.

The jig will securely clamp to the flange of R.S.J's, universal columns or beams 34 for drilling overhead vertical holes without the means of electro-magnets.

The jig can be used as a portable vertical drill-stand, clamped to a convenient R.S.J., column or beam, using the same method of clamping as used for overhead drilling.

The jig can be used as a conventional drill-stand clamped to a work-bench by means of bolts inserted through holes in the platform.

The jig can be quickly released by slackening these bolts, when the jig will slide clear of the platform.

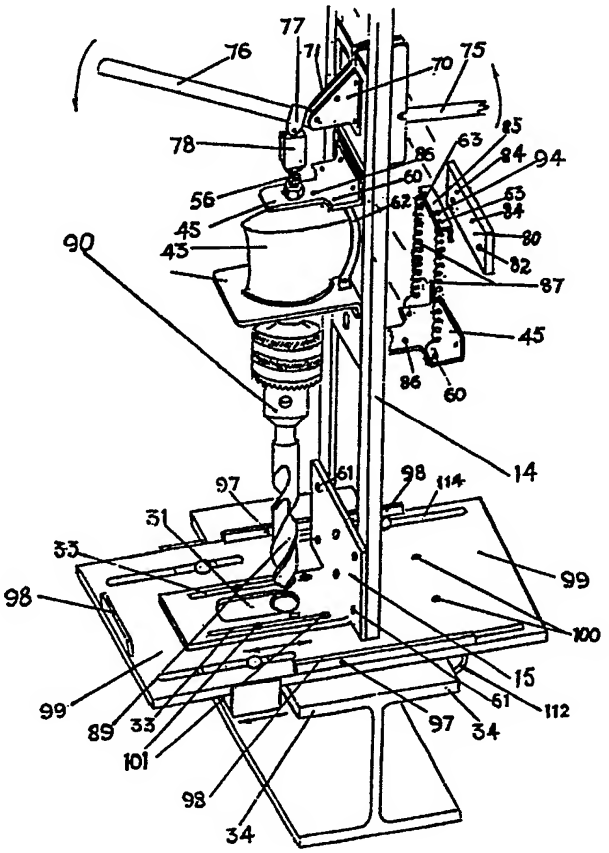

FIG 6

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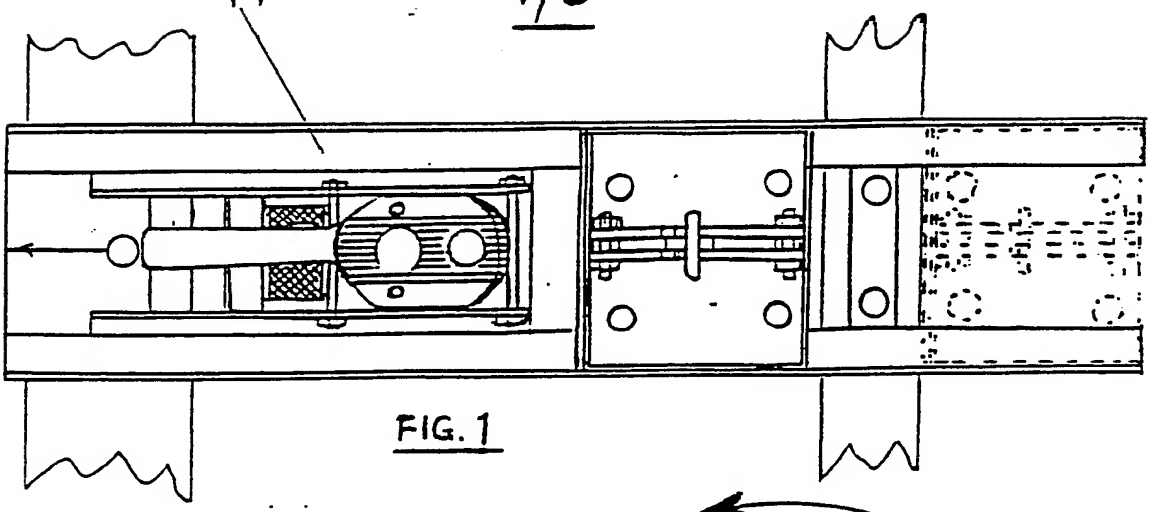


FIG. 1

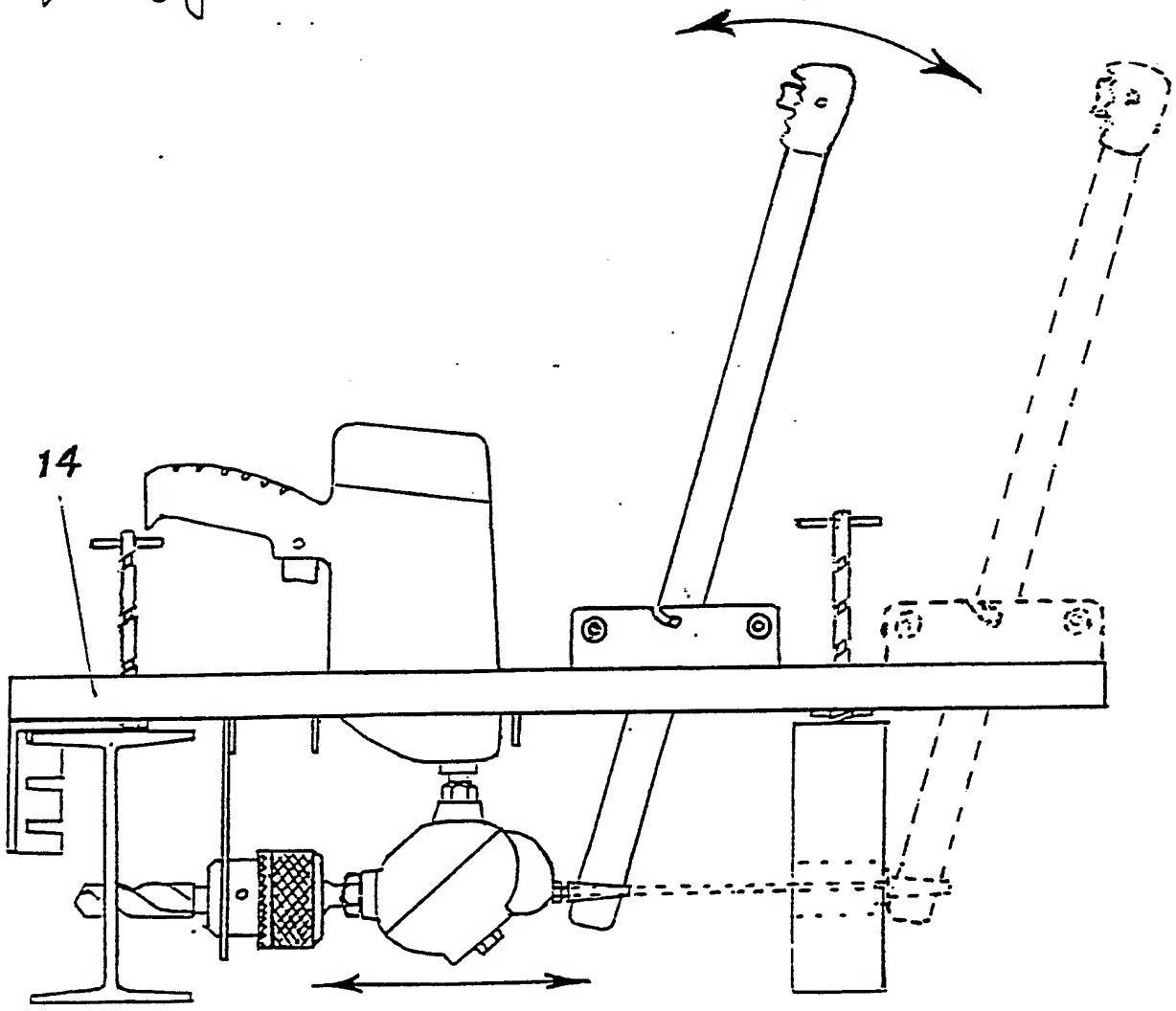
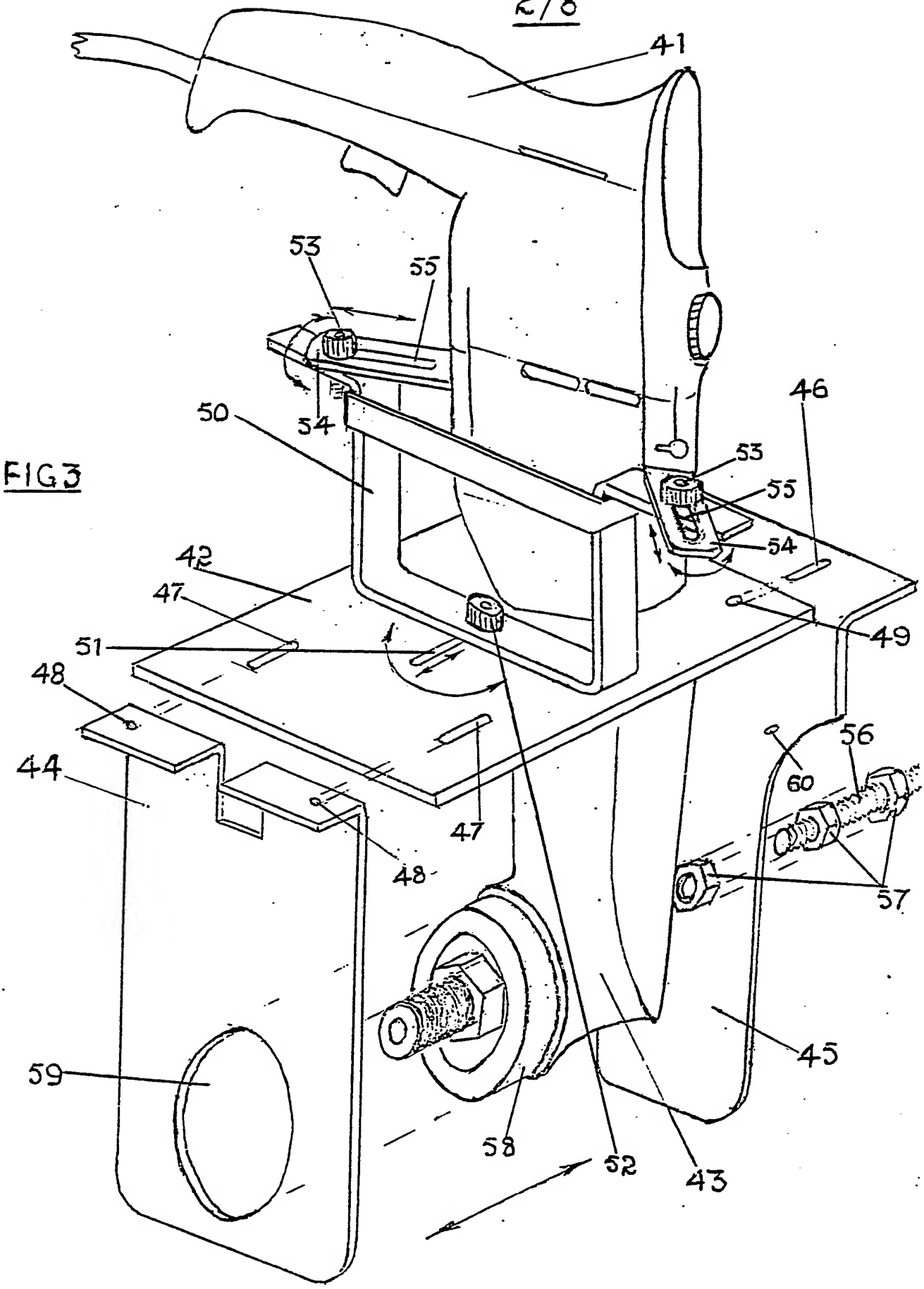


FIG 2

FIG3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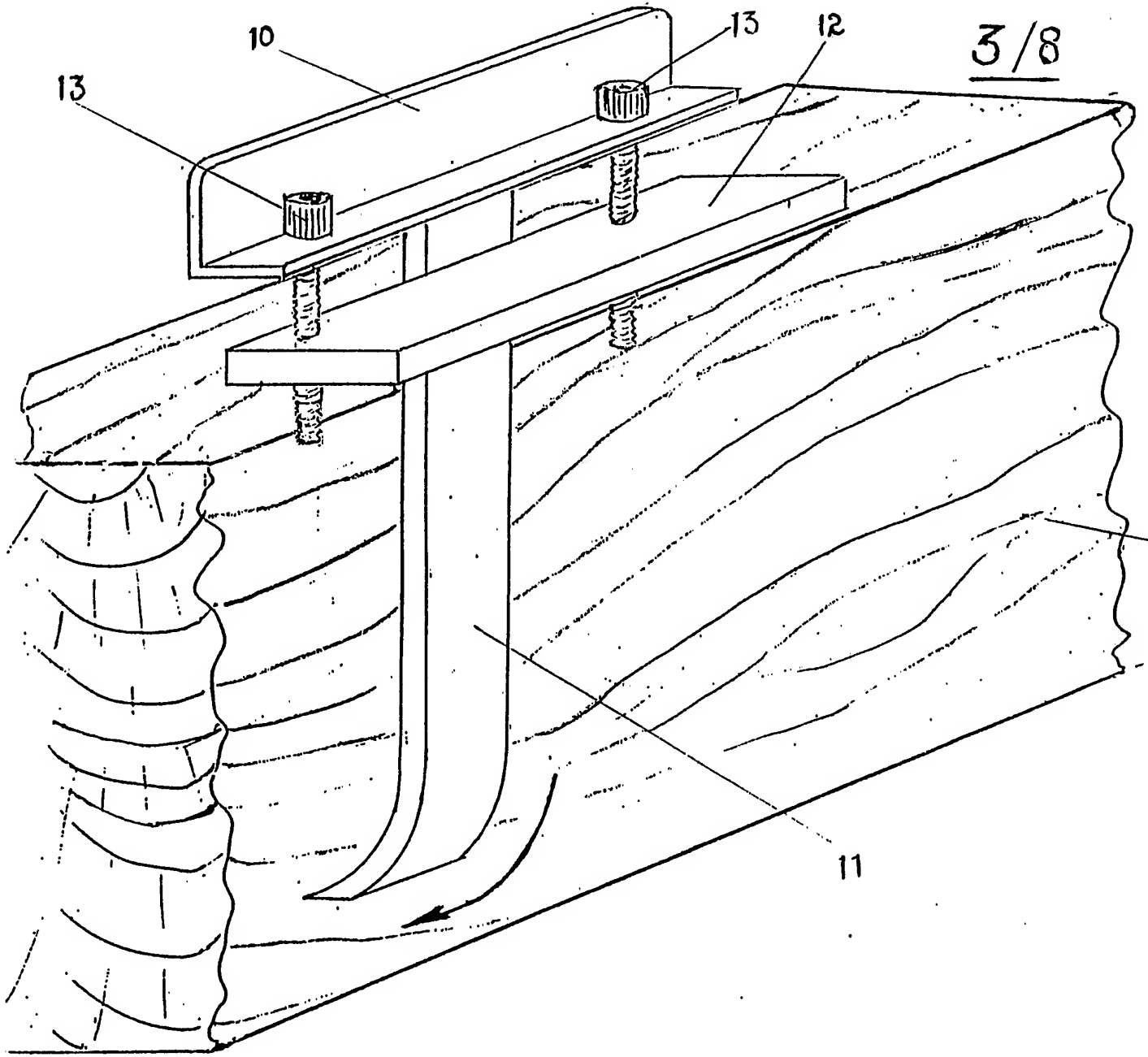

FIG 4

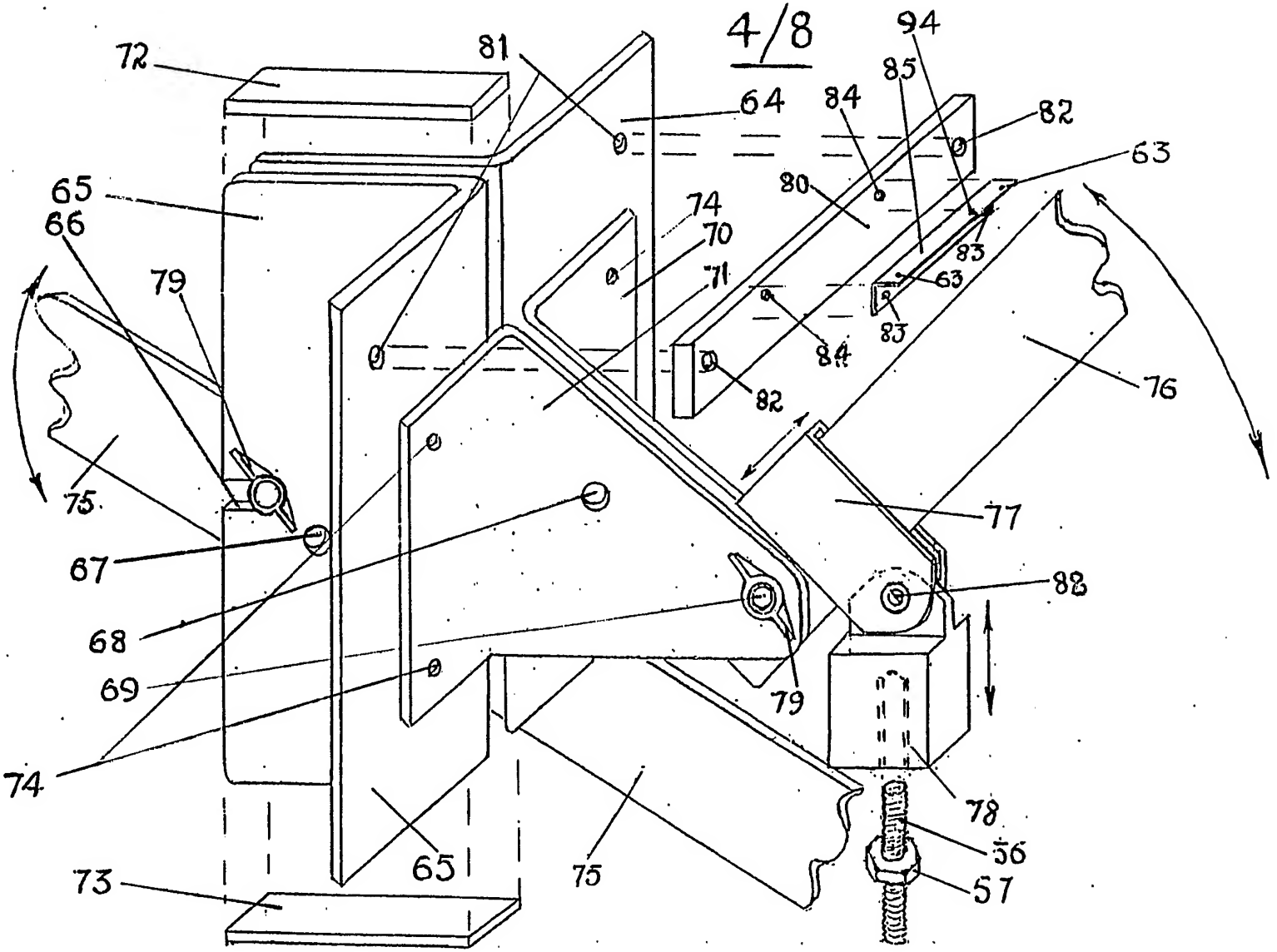
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FIG 5

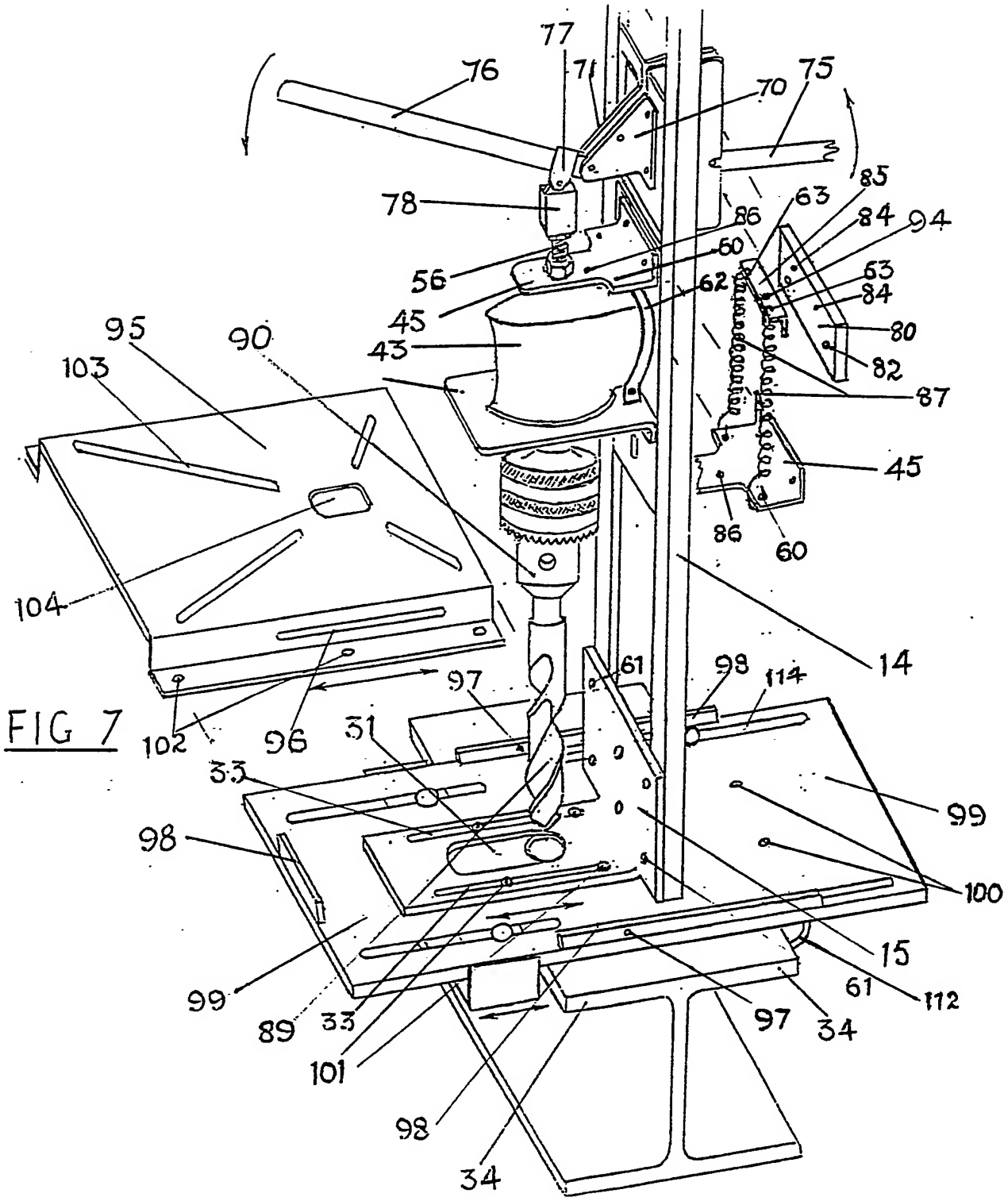
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FIG 7
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FIG 6

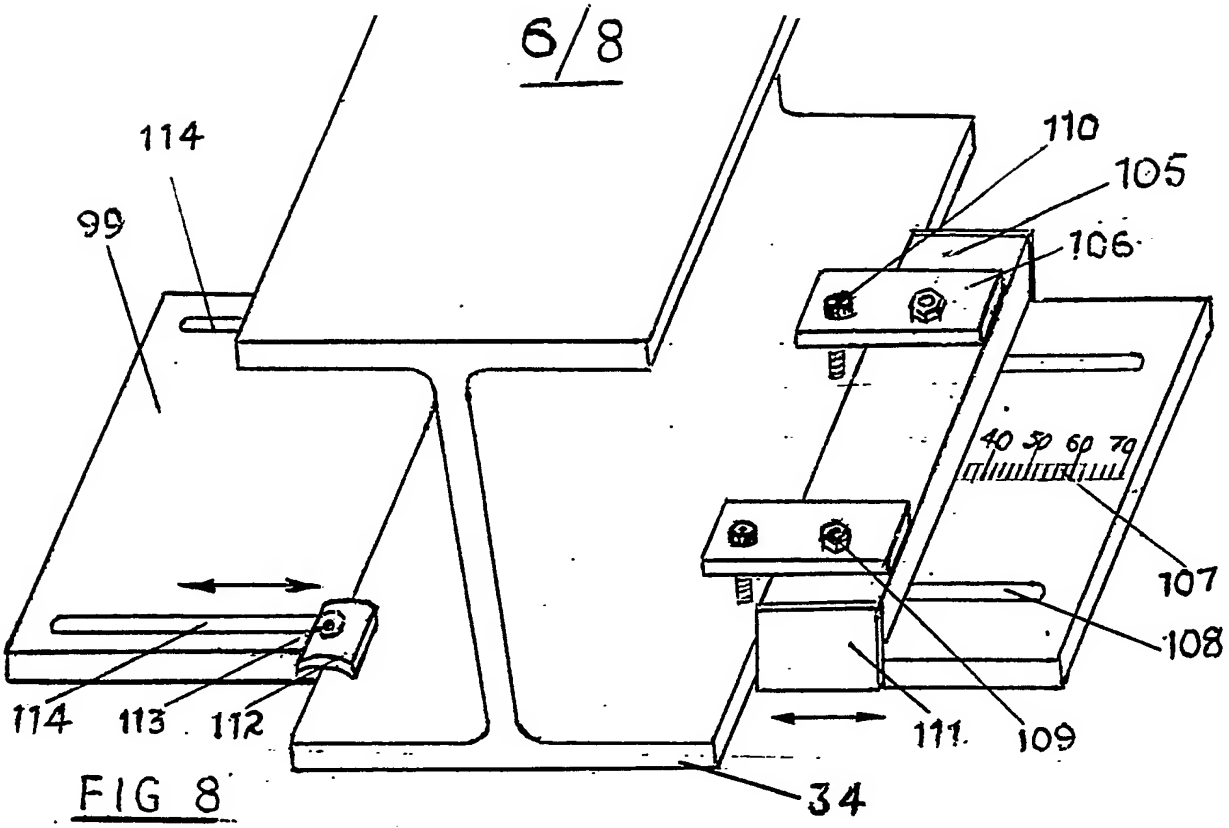
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FIG 8

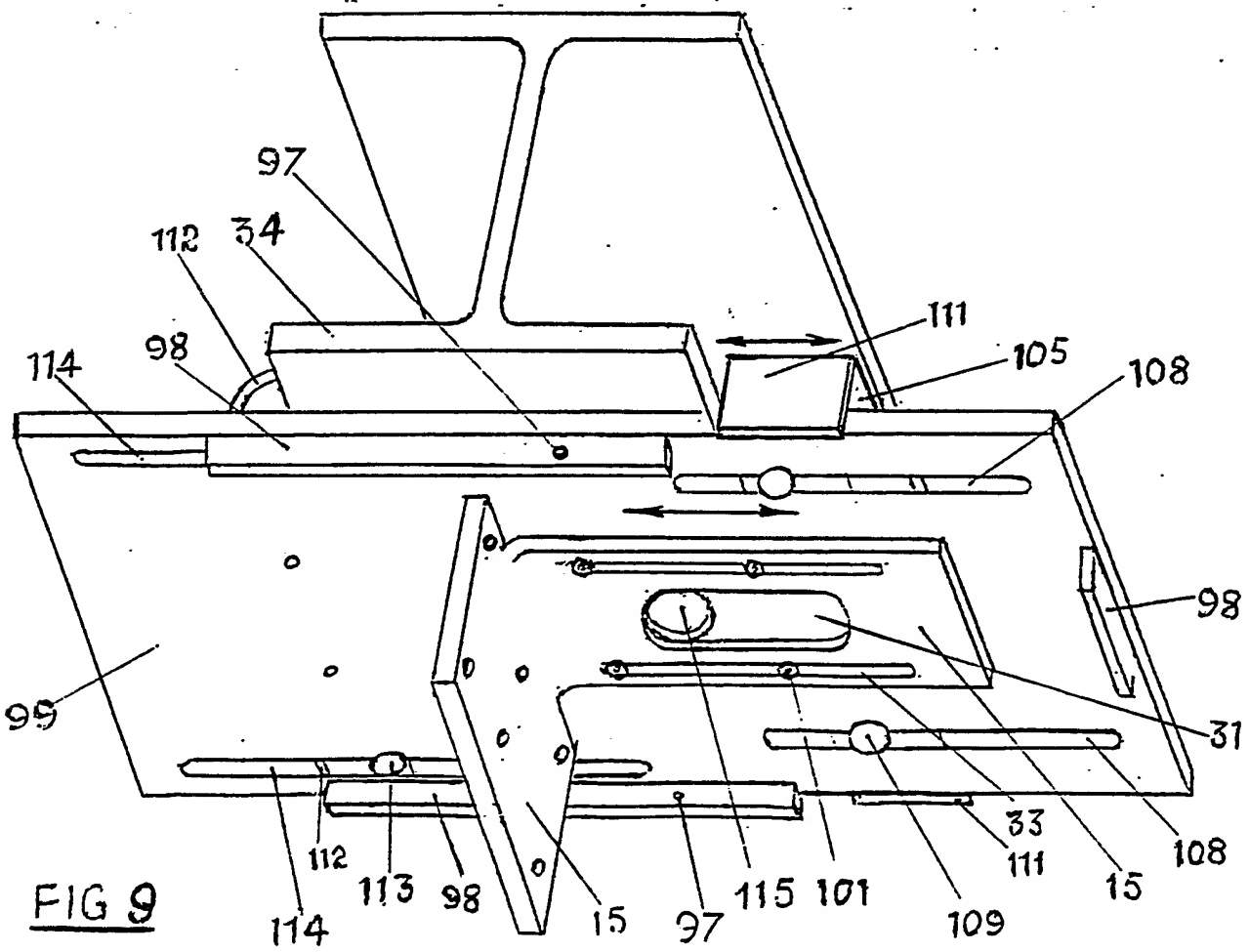
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FIG 9

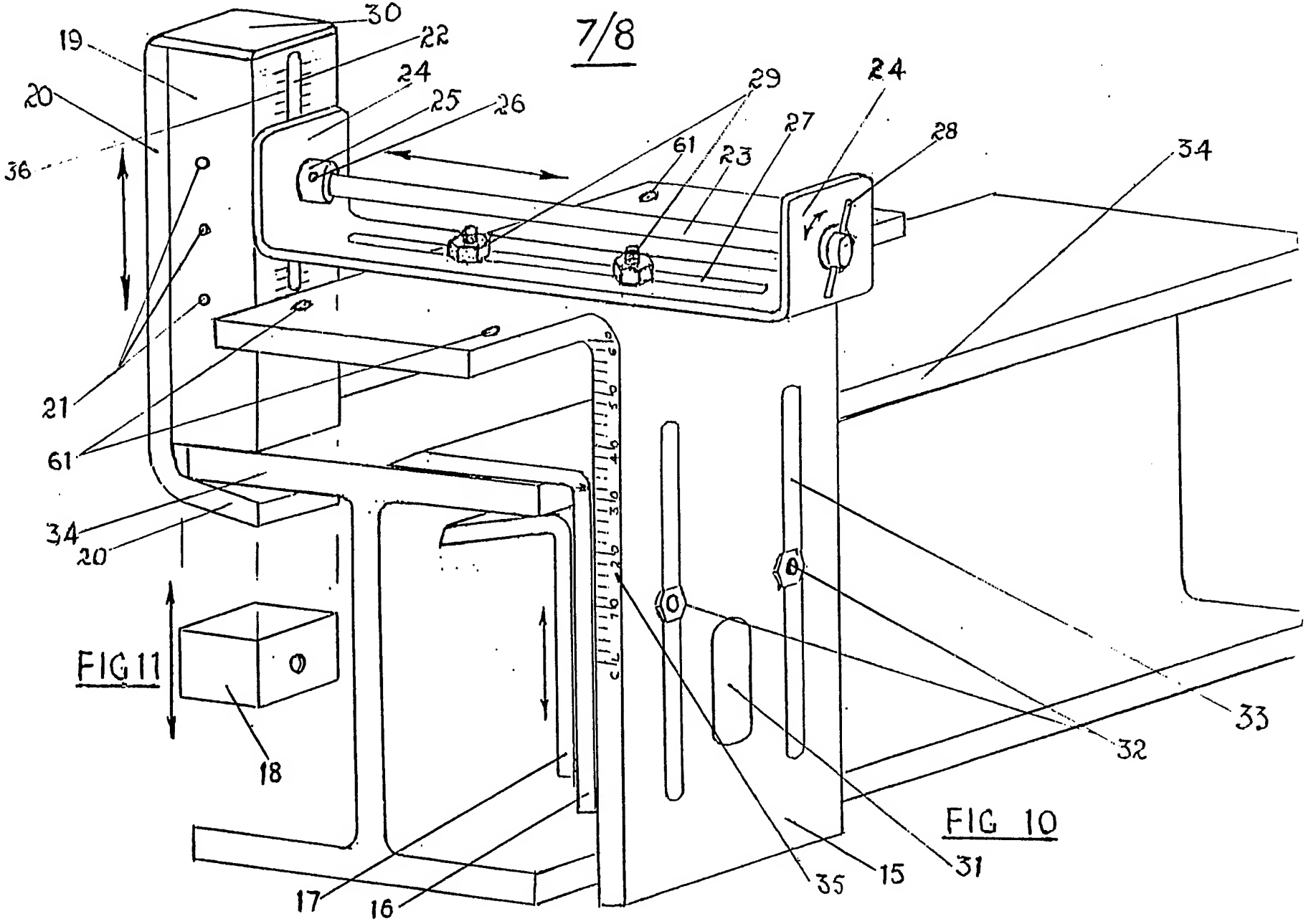
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FIG 11

FIG 10

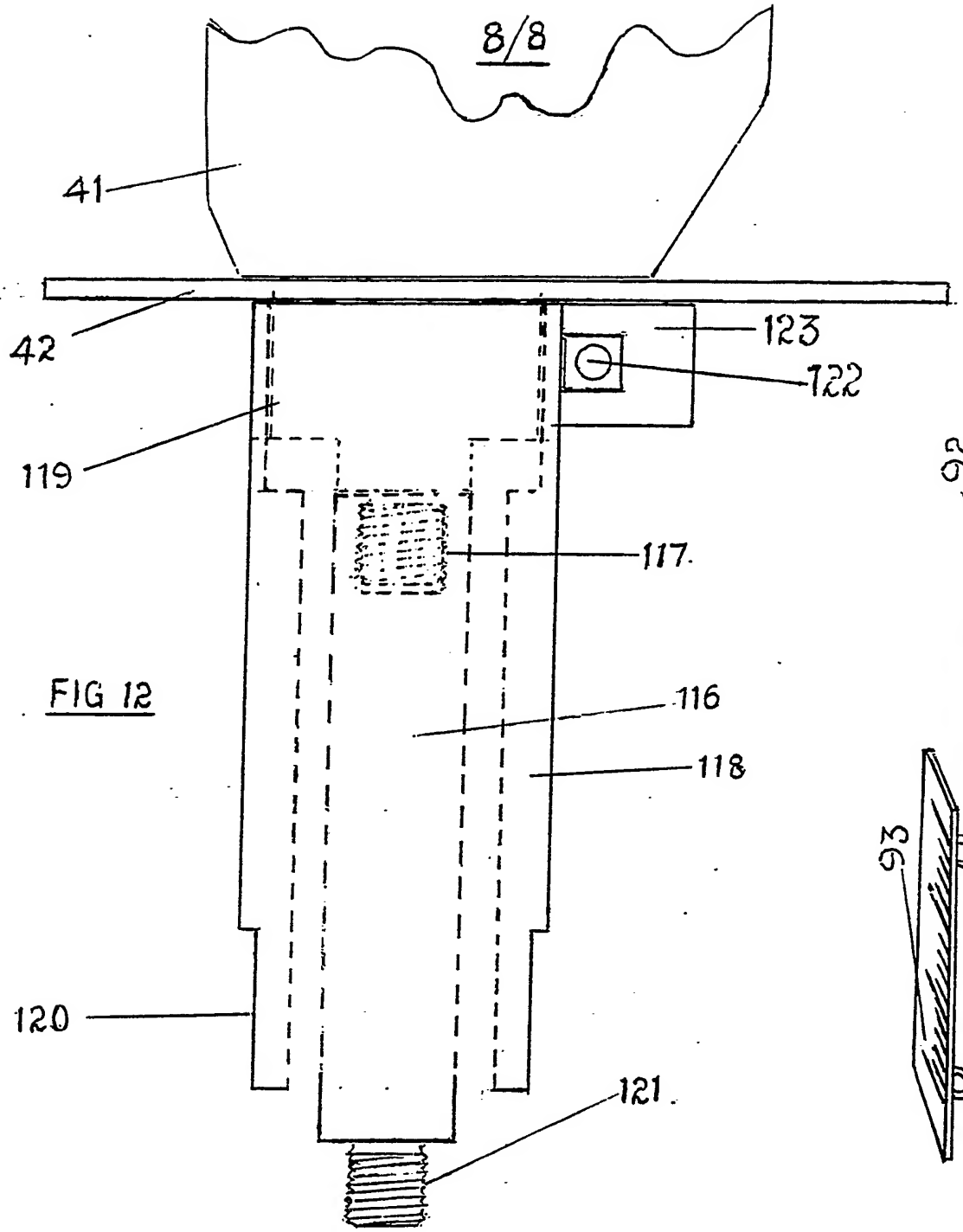

FIG 12

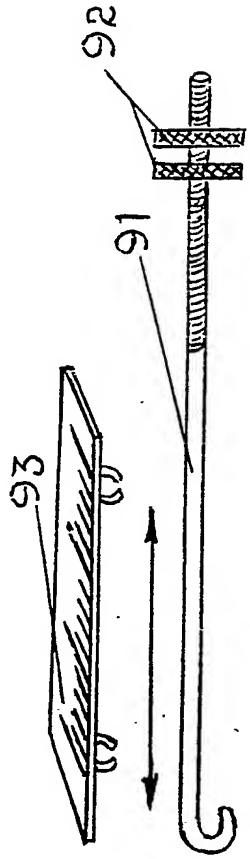

FIG 14

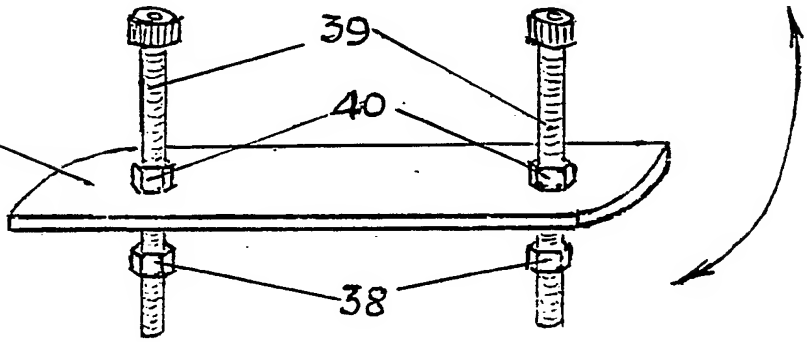

FIG 13

MULTI-PURPOSE DRILLING JIG CONVERSION

This invention relates to the conversion of the Underfloor Drilling Jig & Frame, Patent Application PCT/GB91/00399 to enable the jig to be used in other embodiments than is covered by the original application. The extra uses of the new application are as follows:-

1/. For the vertical drilling of Flanges of overhead R.S.J.'s, Universal Columns and Beams.

2/. For use as a portable vertical drilling machine on building sites, office extensions, Civil Engineering, bridges and roadworks.

3/. For use as a vertical bench drill as used on a work-bench in the conventional manner.

Thus the present invention provides a much more versatile tool that can be quickly converted to many different uses.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 shows a plan view of the original invention, with alternative position of the lever assembly for very close fitted joists;

Figure 2 shows a side elevation view of the original invention;

Figure 3 shows in perspective, an electric drill mounted in the sliding plate, with the gear-box clamped underneath and supported by the front and rear metal adjustable brackets; the pressure-screw; the swivelling and sliding electric drill support bracket and the adjustable finger clamps.

Figure 4 shows the rear 'J' clamp that bites into a wooden joist as it is tightened about the top and bottom of the main frame, thus holding the jig firmly in place when drilling horizontal holes.

Figure 5 shows in perspective, the extended lever support brackets or housing with four fulcrum holes that produce four different lever ratios; the alternative lever position for use when the jig is used as a vertical drill stand; the sliding swivel pressure-housing used for the purpose of withdrawing the drill-bit after drilling; the pressure-screw connecting-nut; the welded end caps for connecting the main lever-housing brackets; the underneath tapped clamping plate that clamps against the underside of the main frame to hold the housing in its required position for drilling; the small bracket that is screwed to this plate with two small holes into which two extension springs are fitted to raise the whole drilling unit when the jig is used as a vertical drill stand; the pressure-screw;

Figure 6 shows in perspective, to a smaller scale, the items shown in figure 5, plus the gear-box, gear-box front and rear brackets; (adjustable), bolted onto the sliding plate; the main frame, the front end slotted bracket; the drill-bit and drill chuck; the extension springs; the base-plate to which the jig is bolted; the clamping arrangement that clamps the jig onto R.S.J's, Universal Columns and Beams for overhead vertical drilling or for use as a portable 'on site' vertical drill-stand;

Figure 7 shows the drilling platform that is attached to the base-plate by a screw in the raised lugs of the base-plate, one each side, through the slotted vertical flanges of the platform when using the jig 'on site' as a portable drill-stand, or as a vertical work-bench drill stand , bolted to a bench via the six bolt holes which, when slackened allow the jig to slide out to be used in any of the other embodiments;

Figure 8 shows in perspective, arrangement of adjustable clamping for the drilling of flanges of overhead R.S.J's, Universal Columns and Beams with a large degree of adjustment of the width and thickness of these flanges; with a guide-bar that can be laterally adjusted along calibrations so that the required position of holes can be pre-determined and set, so that multiple holes can be drilled in line;

Figure 9 shows the view from underneath, with the main frame obliterated for clarity;

Figure 10 shows the height adjustment arrangement for horizontal drilling of joists in the floor-ceiling voids and for the overhead drilling of R.S.J's, Universal Columns and Beams, with calibrations for the front and inner front clamping arrangement, the front clamps being adjustable to suit the various thickness of the flanges to which the jig is clamped, as well as being adjustable for setting the height of the jig for the purpose of setting the required position of holes relative to the flange face;(for the purpose of clarity the main frame has been obliterated). Once set, the height can be maintained for multiple drilling as the clamps are released by turning the long bolt. For wooden joist drilling, the clamps 'bite' into the surface of the wood by means of the bevelled edges;

Figure 11 shows the threaded nut that slides within the long tube which is then held in the correct position relative to the calibrations, through the holes in the side of the tube. If required for angled drilling, the inner end of the long bracket can be raised or lowered to suit whatever angle is required.

Figure 12 shows a sectional view of the male/female extension drill-spindle and collar.

Figure 13 shows the quick-release rear jacking plate.

Figure 14 shows the depth gauge, calibrations, and depth stop.

Referring to the drawings, an extra rear clamp 11 is welded to a short steel angle 10 which rests within the existing steel frame 14 of the jig, and is free to slide within this frame 14. The lower clamp-plate 12 has two tapped holes through which two screws 13 pass. The clamp-plate 12 grips the underside of the frame 14 as the screws 13 are tightened, thus holding the bevelled end of the leg of the rear clamp 11 pressed tight against any convenient wooden joist 9. The purpose of this extra rear clamp 11 is to prevent the jig attempting to slide forward when fast cutting auger bits are used to bore holes, as the corkscrew action of these augers is so fast that the jig is drawn swiftly forward causing the front brackets 15, 16 and 17 to move forward and cause the jig to become loose. This only applies when the jig is used for drilling horizontal holes in wooden joists underfloor, as when used for drilling overhead R.S.J's, Universal Columns and Beams in either the vertical or horizontal plane, the jig is securely held in place by other clamping methods.

The new method of controlling the height of the front end of the jig for either drilling horizontal holes in underfloor wooden joists or for drilling horizontal holes in the overhead embodiment is shown in Figures 10 and 11. When drilling wooden joists, nuts 32 are slackened to allow bracket 16 to rest upon the top edge of the joist, the whole assembly is then raised until the correct height is obtained when the nuts 32 are re-tightened within the slots 33. The rear clamp 11 is tightened against the face of joist 9 at the rear of the jig at the desired height; the rear clamp 11 and the front bracket 17 will bite into their respective joists and hold the jig secure. An alternative method is to lower brackets 16 and 17 to below the top edge of the joist before tightening the nuts 32, in which case front bracket 16 will bite into the joist, but with the jig a little further forward. Calibrations 35 on the edge of bracket 15 will enable the height of the holes to be pre-selected and maintained for multiple drilling at this selected height. A quick release rear jacking plate 37 with welded nuts 38 is an alternative method of controlling the height of the rear of the jig. The radiused ends of the jacking plate 37 allow it to be twisted so that it is then released from the slots within the main frame 14. The height of the frame 14 is governed by the screws 39 bearing down upon joist 9 and secured by lock-nuts 40. Brackets 16 and 17 are slotted to allow individual adjustments. To pre-select the required height of the jig for the overhead drilling of R.S.J's, Universal columns and Beams, the front brackets 15, 16 and 17 are adjusted for height and thickness of the flange 34 in the same manner as previously described. The inner flange 34 is clamped securely at the desired height by means of inner tapered clamp 20 which is welded to the channel 19 and top cap 30. Slot 22 allows the long threaded bolt 23 to enter inside the channel 19 and engage into the threaded nut 18 which slides within channel 19 and is clamped at the pre-selected height as indicated on the calibrations 36 by a grub screw in one of the holes 21. Brackets 16 and 17 are used only for drilling in the horizontal plane.

The 'U' shaped bracket 24 has a long slot 27 that allows for a very large amount of lateral adjustment when the nuts 29 are released. The long threaded bolt or spindle 23 is partly unscrewed from nut 18, brackets 16,17,20 are placed against flanges 34 and nuts 29 are then tightened. The long bolt or spindle 23 is tightened by means of the 'tommy bar' 28 and the tapered 'jaws' hold the jig very tightly without any support from the rear end of the jig. Two thrust bushes 25, (the front one is hidden by the front end of 'U' bracket 24) are held in place by two grub screws 26 to prevent lateral movement of the long bolt or spindle 23. Multiple holes are drilled at the same height by undoing the long bolt or spindle 23 without slackening any of the brackets and losing the pre-setting of the heights. For the purpose of clarity, the main frame 14 has been omitted from figure 10. Angled holes can be drilled by slackening the long bolt or spindle 23 and grub screw in one of the holes 21, and the inner height control clamp 19,20,30, is raised or lowered to obtain the required angle; screw in hole 21 and bolt 23 being then re-tightened. Four holes 61,(one of which is not visible) are for attaching the main frame 14. Elongated hole 31 is only used when drilling through flanges 34 in the vertical plane, or when the jig is used as a portable drill-stand or as a vertical bench drill-stand as shown in figure 6.

Figure 3 shows, in perspective, most of the sliding portion of the jig. A standard electric drill 41, with a standard 43mm collar 119 figure 12 is fitted into the sliding-plate 42. The 90° gear-box 43 is clamped onto drill collar 119 that protrudes through the bottom of the sliding plate 42 by the means of a clamp or clip 62(Figure 6). The front gear-box bracket 44 is attached to the sliding plate 42 by two nuts and screws(not shown) through holes 48 and slots 47 that allow for adjustment. The hole 59 in bracket 44 locates over the machined boss 58 of the gear-box 43, thus holding it secure and central to the line of movement of the sliding plate 42 when pressure is applied to the pressure-screw 56. The rear gear-box bracket 45 is attached to the sliding-plate 42 by two nuts and screws (not shown) through slots 46 and holes 49,(One hole and slot being hidden from view by other parts of the drawing.) The pressure-screw 56 is inserted through a hole (not shown) in the rear bracket 45 and adjusted to bear on the gear-box 43 and then locked into place by nuts 57. To avoid excessive pressure on the gear-box 43, the pressure-screw 56 is adjusted by means of the nuts 57 so that the rear gear-box bracket 45 absorbs some of the pressure. The electric drill 41 is supported by bracket 50 which is held in place by screw 52 through slot 51. Bracket 50 can slide forwards and backwards and swivel to bear upon the body of the electric drill 41 or can be tightened clear of the body so that the small fingers 54 can be adjusted to bear upon the body, depending upon the configuration of the body of the electric drill 41. Packing pieces (not shown, or lock-nuts, not shown) are provided to raise the fingers 54 clear of any vents that may be in any particular electric drill 41. This arrangement ensures that the torque pressure upon the electric drill 41 when drilling through metal does not cause it to twist. The fingers 54 have slots 55 for adjustment and screws 53 to clamp.

Figure 5 shows the new design multi-ratio lever housing, which consists of four brackets and two end caps. The original housing was made from four parts, bolted together and had one curved central slot for quick release for use when drilling holes in the void between floors and ceilings. The curved slot was found to be unsatisfactory when attempting to withdraw a drill-bit that was jammed or inclined to jam, as the lever tended to 'ride up' the curved slot. Furthermore the leverage was not sufficient for the drilling or milling of overhead R.S.J.'s, Universal Beams and Columns. The new design consists of brackets 64 and 65, with straight slot 66 for quick release of lever 75, and a fulcrum hole 67 for overhead drilling of wooden joists or small holes in steel. The straight slot 66 overcomes the difficulty as described above with the curved slot. Brackets 70 and 71 are bolted to brackets 64 and 65 respectively through holes 74, or, if preferred, could be welded. End caps 72 and 73 are welded to brackets 64 and 65, one cap at each end. Fulcrum hole 68 in brackets 70 and 71 achieve a much greater degree of leverage, with fulcrum hole 69 the maximum leverage ratio possible. Bolts are shown with wing-nuts 79 in place. Lever 75 is the long master-switch-controlled lever as used in the original application, but additional holes, (not shown,) to enable it to be used from the lower, (opposite), direction when the jig is used as a vertical drill stand have been added. Lever 75 is shown assembled in the position normally used for underfloor drilling, namely in the slot 66 with wing-nut 79 in place to prevent the bolt, not shown, from sliding out of the hole, not shown, in the lever 75. A pivot pin, or spindle may be a preferred arrangement if used exclusively for underfloor drilling, (not shown.) Lever 75 can also be assembled into pressure-housing 77 from the position shown and pivoted through holes 67, 68 and 69, resulting in four different leverage ratios depending on the materials to be drilled and the size of holes required to be drilled. The amount of lever 75 travel allowed by the new lever housing 64,65,70,71,72,73, is a great improvement on the original housing as shown in figures 1 and 2. Removal of the two bolts and supporting cross-members from the original application will achieve increased travel of the lever 75 and, consequently, increased movement of the drill-bit 89, figure 6; of particular help when drilling through the thicker wooden joists often to be found in older properties. With lever 75 in the position shown in figure 5, but pivoted through holes 67,68 and 69, the jig becomes a much more versatile tool, particularly when used in the overhead embodiment for either horizontal drilling of the webs of R.S.J's, Universal Columns and Beams, or the vertical drilling of flanges 34. Although the lever 75 can be used when the jig is used as a portable vertical drill stand or as a bench drill stand, it will probably be more convenient to use a shorter lever 76, without the master switching control, as shown in full in figure 6. When either lever 75 or 76 is inserted from the position as shown for lever 76, the direction of pressure required for drilling is downwards, which is more convenient when used in this embodiment. Lever 75 or lever 76 is inserted through pressure-housing 77, which is connected to pressure screw connecting-nut 78 by means of screw 88. Pressure-screw 56 is screwed into threaded nut 78 and locked into place by lock-nut 57. The other end of pressure screw 56 is passed through hole, (not shown) in the gear-box rear bracket 45 and locked in place by lock-nuts 57. Pressure applied

by lever 75 or 76 is transmitted to the drill-bit 89 by means of the swivelling action of the pressure-housing 77, the pressure-screw connecting-nut 78, the pressure-screw 56, the gear-box 43 and the drill chuck 90, Reverse action of the lever 75 or 76 will cause the drill-bit 89 to be withdrawn after drilling.

The lever housing 64,65,70,71,72 and 73 is clamped into the correct position relative to the position of the drill-bit 89 by means of two screws,(not shown,) through drilled holes 81 into clamp plate 80, thereby clamping the lever housing 64,65, 70,71,72 and 73 about the main frame 14, figure 6. The lever housing 64,65,70,71,72 and 73 rests in between the perpendicular sides of the metal angle section main frame 14, and the clamp plate 80 tightens upon the underneath of the frame 14 when the two screws,(not shown) are inserted into the threaded holes 82 in the clamp plate 80, and then tightened. A metal angle shaped bracket 85 is screwed to clamp plate 80 by screws,(not shown) inserted through drilled holes 83 into threaded holes 84. The two outer holes 63 in bracket 85 are for the attachment of two extension springs 87, which cause the whole drilling and sliding section 41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59, 60,62,63,75,76,77,78,87,88,89 and 90 to be returned to their respective positions prior to the commencement of the drilling operation. The bottom of the two extension springs 87 are attached through two holes 60 in bracket 45. The off centre hole 86 in bracket 45 and off centre hole 94 in bracket 85 is for the fitting of a hooked threaded rod 91 and a calibrated metal or plastic strip, 93 which is clipped to it, combining as a gauge and depth stop, of particular use when drilling 'blind holes' and multiple drilling. Knurled nuts 92 are adjusted to suit the require depth and locked, one against the other. The threaded part of the rod 91 is passed up through hole 94 in bracket 85, the hooked end is then hooked into hole 86 in bracket 45, and the two knurled nuts 92 are screwed on to the end and adjusted as described above. The hooked end of rod 91 is shaped to spring into hole 86 to ensure that it does not fall out in use. The top threaded part of the rod 91 passes freely through hole 94 in the bracket 85 until the knurled nuts contact the face of the bracket 85, thus preventing any further downward movement. The holes 86 and 94 are off centre to avoid the lever 75 or 76. Plastic tubes, (not shown) cover the springs 87 for safety. These two tubes, just less than the length of the retracted springs 87 are clipped to bracket 45, one to each spring, and two tubes fit over these, clipped to bracket 85.These plastic tubes act in the manner of a concertina, with the springs 87 covered at all times.

When used in the embodiment of a portable drill stand or vertical bench drill, the platform 95 is attached to the base-plate 99 by means of a screw (not shown) through slots 96 in platform 95 into threaded holes 97, one screw to each side. The platform 95 provides a flat surface and covers the heads of screws and nuts. The four screws 101, which have countersunk heads, are fitted from the underneath side of the base-plate. The nuts can be removed and one pair of screws 101 can be replaced in holes 100 to achieve a more balanced work surface if required. Elongated hole 31 in front bracket 15 is adjustable to allow for different

dimensions of gear-boxes. Slots 33 in front bracket 15, and slots 96 in platform 95 are provided for these adjustments. When the jig is used in the embodiment of a conventional vertical drill-stand, platform 95 can be bolted to a work-bench through the six holes 102, (only three holes being visible in figure 7.) The height of the bearers or lugs 98 is slightly more than the inside vertical height of the platform 95, therefore when the bolts(not shown) in the six holes 102 are tightened, the platform 95 will securely clamp the base-plate 99 onto the bench, thereby making the two screws (not shown) that pass through slots 96 in platform 95 into threaded holes 97, superfluous. To release the whole jig to be used in another embodiment simply requires the six bolts, (not shown) in holes 102 to be slackened, enabling the jig to slide out from under platform 95. Slots 103 are provided for the clamping of work or for drilling vices, and elongated hole 104 is provided to allow drilling to pass clear through the work being drilled, taking into account that the centre-line varies between one brand of gear-box and another.

To use the jig in the vertical overhead embodiment requires only small changes. Long lever 75, with the master controlled switching system is preferred, inserted in the direction as indicated in figures 5 and 6, as then the pressure will be applied in a downward direction upon the lever 75. In this embodiment it is, with the exception of the matter of the lever 75 as above, the same embodiment as the portable vertical drill-stand, reversed by turning the whole thing upside down. The jig is physically clamped onto the overhead R.S.J., Universal Column or Beam in the same manner as the original application, with no electromagnets involved. For the sake of clarity figures 8 and 9 show only the clamping arrangements, the base-plate 99, and the front end bracket 15. The adjustable guide 105 is a rectangular hollow tube with two flat pieces 106 welded to the wider face, and the narrower dimension being more than the thickness of any flange to which the jig has to be clamped. Coach screws 109 clamp the adjustable guide tube 105 in the desired position by reference to the calibrations 107 indicating the distance from the edge of flange 34 to the hole to be drilled. The length of the guide tube 105 is very slightly more than the width of the base-plate 99, and when the end plates 111 are welded to the ends of the guide tube 105 the guide tube 105 will slide freely along its prescribed path without jamming. When the position of the hole to be drilled has been decided, guide tube 105 is clamped by coach screws 109 within slots 108. Then cap screws 110 are unscrewed sufficiently to allow flange 34 to butt up to the face of the guide tube 105. The two curved clamp-plates 112 are then moved within slots 114 to the furthest outward position with the coach screws 113 unscrewed. The jig is then lifted into position with the guide tube 105 agaist the flange 34. Curved clamp-plates 112 are moved into position about the flange 34 and screws 113 tightened. Cap screws 110 are also tightened. Pressure is applied to the lever 75 in a downward direction to complete drilling. To drill repetitve holes in line, cap screws 110 and curved clamp-plate screws 113 are unscrewed sufficiently for the jig to be moved along the flange 34. The curved clamp plates 112 will clamp any thickness of flange 34 within the range of the jig's capacity due to the unusual configuration, unlike conventional flat clamp plates that will only clamp within a restricted range.

Due to the variations in dimensions of different gear-boxes, the front bracket 15 is adjusted by unscrewing the four screws 101 and moving the front bracket 15 along the slots 33. A drill the same size as the hole 115 in base-plate 99 is inserted in the drill chuck 90 and the chuck is tightened; the drill is moved into the hole 115 by the use of the lever 75 and then the screws 101 are re-tightened. The gear-box centre-line or axis will now be in line with the centre of hole 115 in base-plate 99 and drilling can commence. Drilling bushes of various hole sizes could be placed into holes 31 and 115 in the front bracket 15 and base-plate 99 repectively for precision drilling and support of smaller drill-bits. Tapping-Heads, taper-drive final drive gear-boxes 'futuro' keyless chucks, hammer-action drive shafts are all features that could be used to advantage, particularly for very heavy industrial uses such as site work and bridges.

When the jig is used for overhead drilling of the web of R.S.J's, Universal Columns or Beams, the maximum distance from the flange-face 34 to the centre of the hole to be drilled is governed by the distance from the top face of the particular gear-box, (not shown,) to the centre-line or axis of the particular gear-box, which varies considerably from one model to another. To provide a method of increasing this maximum distance, of particular use on large bridges or industrial uses, a series of extensions is now described and shown in figure 12, in sectional view. A male-female spindle 116 is screwed onto the drive spindle 117 of the electric drill 41. An outer male-female tube 118 is clamped around the collar 119 of the electric drill 41 by means of the lugs 123 and bolt 122 in the accepted manner of extensions. The gear-box 43 is then clamped around the extended collar 120 in a similar manner,(not shown.) The normal drive-nut,(not shown,) is screwed onto the extended drive shaft 121. The whole extension fitting 116 and 118 will increase the maximum dimension as described above by the length of this fitting 116, 118. No extra support for the extended drive shaft 116 is required as it is adequately supported by the drive spindle 117 of the electric drill 41 at one end and by the drive nut, (not shown) of the gear-box 43. The front gear-box bracket 44, rear bracket 45, extended lever housing brackets 70 and 71 would have to be also extended by the same amount as the length of the above extension male-female spindle 116 and tube 118. The original height adjustment method as described above,(page 3,) will still apply. The position of the fulcrum holes in lever 75 would also have to be re-sited to compensate for the extra depth, but lever 76 would remain the same.

The modified swivel pressure housing 77, pressure-screw connecting nut 78 with connecting screw 88 is much more efficient than the pressure screw housing, pressure-screw with inset ball as was used in the original application because the present fittings roll around the radius rather than slide, and the pressure of the lever 75,76 is always at right-angles to the lever 75,76. Also the clearance between the swivel pressure housing 77 and the lever 75,76 is constant and minimal, resulting in a more precise control of the drill-bit 89, whereas a considerable amount of clearance was necessary with the original pressure screw housing to allow the lever to apply pressure at an angle to the pressure-screw. This caused 'back lash' and a certain amount of loss of control.

CLAIMS

1. A drilling jig comprising multi-configuration adjustable clamp means for clamping to or across a desired one or more of a plurality of different facets or flanges of a joist, beam or column to enable drilling into a predetermined surface.

2. A jig according to claim 1, further comprising arrestor means for preventing the jig from being pulled forward in use.

3. A jig according to claim 2, wherein the arrestor means comprises a hooked or toothed member for location at or near an end of the jig remote from a drill mounting end.

4. A jig according to any preceding claim, further comprising calibration means for enabling drilling of a plurality of holes at predetermined positions spaced apart in a plane.

5. A jig according to any preceding claim, further comprising support means enabling the jig to be used as a drill stand or to be mounted on a work surface.

6. A multi-purpose drilling jig for drilling Flanges of overhead rolled steel joists, universal columns or beams in the vertical plane.

7. A multi-purpose drilling jig that can be used on building sites, bridge building or roadworks as a portable vertical drill stand when clamped to any convenient rolled steel joist, universal column or beam.

8. A multi-purpose drilling jig that can be clamped to a workbench and used as a conventional bench drill stand.

9. A multi-purpose drilling jig that can be quickly released when used as in claim 8 by the slight release of the retaining bolts without the need to completely remove these bolts.

10 A multi-purpose drilling jig with a variable height adjustment arrangement for underfloor drilling or overhead drilling in the horizontal plane.

11 A multi-purpose drilling jig with calibrated height settings for precision drilling in the horizontal plane.

12. A multi-purpose drilling jig that can be pre-set and used for the drilling of multiple holes, repetitively, without the need to re-set the jig on being transferred from one R.S.J., universal column or beam to another in the horizontal plane.

13 A multi-purpose drilling jig without constricting cross-members or bolts in the construction of the lever housing, resulting in a greatly increased arc of movement of the lever.

14. A multi-purpose drilling jig that has a perpendicular slot instead of a curved slot in the lever housing to prevent the lever 'riding up' the slot when the direction of the lever is reversed to withdraw the drill-bit from the hole being drilled.

15. A multi-purpose drilling jig that has extension brackets fitted to the lower part of the original lever housing to provide extra fulcrum or pivot holes, thus providing a varied range of leverage ratios for the lever when mounted about these fulcrum or pivot holes.

16. A multi-purpose drilling jig as claimed in claims 13-15 is arranged in such a manner that the insertion of the lever can be from the opposite direction when the jig is being used in the portable drill stand or vertical drill stand embodiment so that the pressure upon the lever is in a downward direction instead of being in an upward direction, which would be very inconvenient when used in this embodiment.

17. A multi-purpose drilling jig that has a pressure housing that can freely swivel around the pressure-screw connecting-nut and slide freely along the lever as pressure is applied, with a minimal amount of clearance between the pressure housing and the lever, resulting in a more positive control of the drill-bit, particularly when the drill-bit has to be quickly withdrawn from the hole to prevent jamming.

18. A multi-purpose drilling jig that has a main master controlled double-pole safety switch within the insulated handle that cuts off supply of electricity to the electric drill as soon as pressure upon the switch is released.

19. A multi-purpose drilling jig that has extra holes drilled in the lower section of the lever to allow such lever to be inserted into the lever housing from the opposite direction and connected to the lower fulcum or pivot holes from this direction to enable pressure on the lever to be brought to bear in a downwards direction when the jig is to be used in the embodiment as a portable vertical drill stand or a vertical bench drill stand.

20. A multi-purpose drilling jig that, when drilling holes in flanges of R.S.J's, universal columns or beams has a calibrated adjustable guide by means of which the position of a hole can be selected and pre-set before the jig is placed into position, and this selection, once set, can be maintained as long as is required, including transfer of the jig to another R.S.J., universal column or beam.

21. A multi-purpose drilling jig into which can be fitted standard hardened drilling bushes for precision drilling.

22. A multi-purpose drilling jig that has curved clamp plates that will clamp flanges having a large variation of thickness, automatically, as opposed to the normal flat type of clamp plate that will only clamp material of a thickness for which the clamp plate is designed.

23. A multi-purpose drilling jig that has an adjustable frame to support an electric drill, with adjustable fingers, to prevent torque pressure from twisting the electric drill within the sliding plate to which it is fitted.

24. A multi-purpose drilling jig that will house an electric drill with a standard collar size without the need to modify such electric drill.

25. A multi-purpose drilling jig that will house a 90° gear-box within brackets without the need to modify such gear-box.

26. A multi-purpose drilling jig that has an extension spindle and male/female collar tube to extend the length of the gear-box.

27. A multi-purpose drilling jig that has a quick release rear jacking plate to control the height at the rear of the jig.

28. A multi-purpose drilling jig that has a quick-release depth gauge and depth stop with a slideable calibration plate.

29. A multi-purpose drilling jig that has a rear 'J' shaped clamp with a tapered lower end that bites into a convenient wooden joist as it is held against such joist whilst being tightened by the clamping screws, thus holding the jig firmly in position whilst the drilling process is being carried out.

30. A multi-purpose drilling jig that has a rear 'J' shaped clamp that holds the jig firmly in position even when the jig is raised to any height desired for drilling, or when drilling holes in overhead wooden joists with the jig clamped underneath such joists, or in any plane necessary, according to the position of the joist(s) to be drilled.

31. A multi-purpose drilling jig substantially as described herein with reference to figures 1-14 of the accompanying drawing.

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Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition L) B3C

(ii) Int Cl (Edition 5) B23B

Search Examiner

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Databases (see over)

(i) UK Patent Office

(ii)

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Documents considered relevant following a search in respect of claims 1 TO 7, 31

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1548337 A (WILSON) see Figure 6	1, 2, 5, 6, 7
X	GB 1489240 A (BOYAJIAN) see Figure 1	6, 7
X	US 4978257 A (NOWMAN) see Figure 1	1, 2, 5, 6, 7
X	US 4235565 A (ALBANO) see Figure 1	1, 2, 5, 6, 7
X	US 3874086 A (LUDLAM) see Figure 1	1-7

Category	Identity of document and relevant passages	Relevant to claim(s)
	14	

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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